Louisiana Office of Public Health - Infectious Disease Epidemiology Section
P.O. Box 60630, New Orleans, LA 70160 (504) 568-5005
www.oph.dhh.state.la.us/infectiousdisease/index.html

Kathleen Babineaux Blanco
GOVERNOR

Frederick P. Cerise, M.D., M.P.H.
SECRETARY

Trends in Antibiotic Sensitivity

Karen Lees, MPH

Reprinted from the May-June 2003 Louisiana Morbidity Report

Introduction

Antibiotic resistance is an increasing problem. The 'Antibiotic Sensitivity Active Surveillance System' began in Louisiana with the collection of aggregate data in 2000 to track the emergence of antibiotic resistant organisms. This surveillance program, which allows the state to track and evaluate antibiotic resistance trends, monitors three pathogens: Methicillin resistant *Staphylococcus aureus* (MRSA), drug resistant *Streptococcus pneumoniae* (DRSP), and Vancomycin resistant enterococcus (VRE). The primary goal of the Antibiotic Sensitivity Active Surveillance System is to estimate the proportion of selected bacteria in the state that are resistant to antibiotics by the reporting of laboratory aggregate data.

Methods

Over the past three years, forty-three hospitals have been a part of the surveillance system at some point in time. Currently, thirty-one hospitals provide information to the surveillance system each month on a brief reporting form. Each hospital reports the total number of *S. aureus, S. pneumoniae*, and enterococcus species isolated in their lab for each month. In addition, they also report the total number of drug resistant or drug intermediate resistant isolates for each of those organisms. As duplicates are not reported, the forms contain counts on one isolate of MRSA, VRE, or DRSP per patient per hospital visit. Each report is entered into an Access database, and from this database quarterly and annual summary reports are generated for the participating hospitals.

The purpose of this analysis is primarily to determine if the rates of antibiotic resistance for *S. pneumoniae*, *S. aureus*, and enterococcus were significantly different over the four quarters in 2002 and secondarily to determine if there is a significant trend in the rates of antibiotic resistance for these organisms from 2000 to 2002. Since the interest was in resistance as either present or not present, the resistance and intermediately resistant variables were combined to get one variable for resistance.

For each organism of interest, a chi-square statistic was calculated to determine if the percent of resistant isolates was different from quarter to quarter in 2002. Using the annual rates, a test for trend was conducted using the Mantel-Haensel Chi Square statistic. Both of these analyses were conducted using SAS (Version 8.02; Cary, NC).

Results

The results of the analysis of 2002 quarterly counts of antibiotic susceptible and resistant isolates can be seen in Table 1.

Table 1: Analysis of Antibiotic Resistance by Quarter for 2002 for *S. pneumoniae*, *S. aureus*, and *Enterococcus* species from the Louisiana Antibiotic Sensitivity Active Surveillance System

		First Quarter	Second Quarter	Third Quarter	Fourth Quarter	X^2	p-value
S. pneumoniae							
	Resistant	221	124	70	133	0.0141	0.9996
	Susceptible	279	157	90	170		
S. aureus							
	Resistant	2076	2296	2527	2590	57.7417	<0.0001
	Susceptible	2136	1901	2182	1933		
Enterococcus							
	Resistant	140	151	113	142	1.5974	0.6600
	Susceptible	2394	2503	2133	2297		

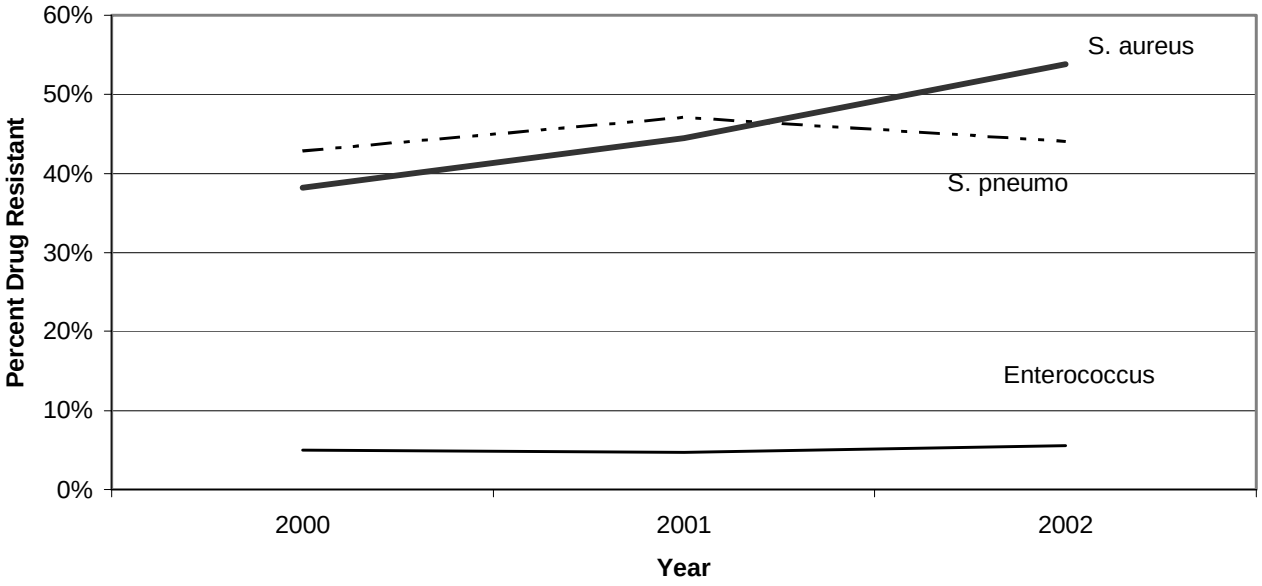
The percentages of drug resistant *S. pneumoniae* were not significantly different from each other ($\times^2$=0.0141, p=0.9996), ranging from 43.8% to 44.2% in 2002. The rates for methicillin resistant *S. aureus* **were** significantly different throughout the year ($\times^2$=57.7417, p<0.0001), ranging from 49.3% in the first quarter to 57.3% in the fourth quarter. In addition, there was a significant increasing trend throughout the year ($\times^2$ for trend =45.6359, p<0.0001); the rates of resistance in the fourth quarter were 16% higher than those in the first quarter. The percentages of vancomycin resistant enterococcus (VRE) ranged from 5.3% to 6.2% in 2002, but these rates were not significantly different from each other ($\times^2$=1.5974, p=0.6600).

A trend analysis was conducted to determine if the rates of resistance were increasing over the past three years (2000, 2001, and 2002). The results can be seen in Table 2 and Figure 1.

Table 2: Trend Analysis of Resistance for 2000-2002 for *S. pneumoniae*, *S. aureus*, and *Enterococcus* species

		2000	2001	2002	X^2 (for trend)	p-value
S. pneumoniae						
	Resistant	547	662	548	0.3767	0.5394
	Susceptible	729	744	696		
S. aureus						
	Resistant	4560	6682	9489	723.1479	<0.0001
	Susceptible	7377	8347	8152		
Enterococcus						
	Resistant	451	496	547	3.0889	0.0788
	Susceptible	8577	10,013	9327		

Figure 1: Percent drug resistant *Streptococcus pneumoniae*, *Staphylococcus aureus*, and *Enterococcus* species, 2000-2002



A Mantel-Haensel chi-square statistic was calculated for each organism. The rates of drug resistant *S. pneumoniae* have not been increasing over the past three years ($\times^2$ for trend =0.3767, p=0.5394). As was seen in the year 2002 data, the rates of methicillin-resistant *S. aureus* were increasing from 2000 to 2002. In 2000, the rate of resistance in *S. aureus* was 38.2%, in 2001 it was up to 44.5%, and in 2002 it was up to 53.8%. These increases were highly significant ($\times^2$ for trend =723.1479, p<0.0001). Rates of vancomycin resistant *Enterococcus* did not significantly increase over the past three years ($\times^2$ for trend =3.0889, p=0.0788).

Outbreak investigations

Reprinted from the March-April 2002
Louisiana Morbidity Report

There has been concerns about increasing numbers of sporadic cases or even small outbreaks of MRSA cutaneous infections.

In October, a parish prison facility reported an unusually large number of boils and cutaneous infections among prisoners. During a 30 day period in October/November 2001 cultures were performed on all the cutaneous infections that presented at the prison clinics. Forty-two cultures that grew an organism included 11 staphylococci methicillin sensitive, 28 methicillin resistant (a 71% proportion of MRSA) and 3 other non-staphylococci bacteria. For a population of 1,600 inmates this represented an incidence of 210 MRSA skin infections /1,000 /year, an incidence well above the norm.

Antibiotic sensitivity was reviewed for 26 MRSA specimens: 19 (73%) were sensitive to ciprofloxacine, 22 (84%) were sensitive to clindamycin, 16 (61%) sensitive to tetracycline and 19 (73%) sensitive to trimethoprim-sulfamethoxazole. This fits the pattern observed in community-acquired MRSA that are considered to be “multi-sensitive.”

The outbreak lasted two months and subsided. Among 10 isolates tested by pulse field gel electrophoresis (PFGE) 5 belonged to type G61 and 4 to type G36. These two types were among the most prevalent in the city. Out of 59 MRSA isolates from several hospitals in the same city tested by PFGE, 19 (32%) belonged to type G36 and 32 (54%) to type G61. This high prevalence of a few PFGE types among community acquired MRSA has been observed before.